Original Article

Histological Subtypes of Lung Cancer in Chinese Males from 2000 to 2012*

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Abstract

Objective To characterize the histological and epidemiological features of male lung cancer patients in China.

Methods The demographic and histological information about male lung cancer patients identified from 2000-01-01 to 2012-12-31, was collected from the Cancer Hospital of the Chinese Academy of Medical Sciences. Relative frequencies (RF) were estimated for major histological subtypes and compared according to the years of diagnosis and birth.

Results The RF of adenocarcinoma (ADC) increased from 21.96% to 43.36% and the RF of squamous cell carcinoma (SCC) decreased from 39.11% to 32.23% from 2000 to 2012 in the 15 427 male lung cancer patients included in this study (Z=17.909, P<0.0001; Z=-6.117, P<0.0001). The RF of ADC increased from 28.72% in 2000-2004, 36.88% in 2005-2008 to 48.61% in 2009-2012 in patients born after 1960. The age-adjusted RF of ADC in 2007-2012 increased consistently in all the investigated areas.

Conclusion The increased RF of ADC in male lung cancer patients highlights the need for further investigation of the etiologic factors of these tumors. Smoke-free policies rather than modifying tobacco products should be enforced.

Key words: Epidemiology; Lung cancer; Histology

Biomed Environ Sci, 2014; 27(1): 3-9 *doi: 10.3967/bes2014.010* *ISSN: 0895-3988*

www.besjournal.com (full text) *CN: 11-2816/Q*

INTRODUCTION

Lung cancer is the leading cause of death in Chinese men[1-5]. The Chinese National Cancer Center and Disease Prevention and Control Bureau under The Ministry of Health reported that newly diagnosed lung cancer accounted for 22% of all cancers diagnosed in 2009 in Chinese men. The age-standardized (world population) incidence of lung cancer is 47.48% per 100 000, which is higher than that in developed countries[2-4,6]. The incidence of lung cancer in Chinese men in 2009 was higher in urban areas (49.81% per 100 000) than in rural areas (42.01% per

*This work was supported by NIH Project 'Epidemiology and Intervention Research for Tobacco Control in China' (R01 RFA-TW-06-006) and Beijing Run-for-Hope Fund (YF2010-48).

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Received: September 6, 2013; Accepted: November 27, 2013

100 000) while the age-standardized mortality rate was 3-fold higher in 2009 (40.46% per 100 000) than in 1973-1975 (10.25% per 100 000)[2-4]. The increased incidence of lung cancer and mortality as a result of lung cancer in Chinese men are in part due to long-term exposure to cigarette smoking[7-8].

Since the 1950s, convincing data documenting the unequivocal causal relationship between cigarette smoking and lung cancer in developed and developing countries, including China[9-13], has been presented. This association was first observed in lung squamous cell carcinoma (SCC). Later reports documented the association with small cell lung carcinoma (SCLC), large cell lung carcinoma (LCC) and adenocarcinoma (ADC)[12]. In recent years, the histologic subtype of lung cancers has been reported in The United Kingdom, The United States, Finland, Hungary, Spain, Japan, Lithuania, and Tunisia[14-27], where ADC has been more frequently diagnosed than SCC. Smoking behavior and the consumption of tobacco products have thus changed[10]. Few reports on lung cancer are available in China due to limited data on lung tumor histology[28-29].

In this study, the data about Chinese men whose lung cancer was diagnosed between 2000 and 2012 in the Cancer Hospital of the Chinese Academy of Medical Sciences, Peking Union Medical College (CHCAMS-PUMC), was analyzed.

MATERIALS AND METHODS

CHCAMS-PUMC is one of the largest and oldest class-A cancer hospitals in China. It has approximately 1 200 beds, and offers comprehensive surgical treatment, radiotherapy, chemotherapy, therapeutic and pathologic services, and consultations for patients from Beijing and all parts of mainland China.

Data Sources and Selected Cases

Histology-confirmed male lung cancer patients (C34, ICD-10) with complete demographic information (gender, nationality, year of birth, residential address) admitted to CHCAMS-PUMC from 2000-01-01 to 2012-12-31 were included in this study. The area and time variations in more than 400 patients with lung cancer from 9 geographic areas were analyzed in the present study.

Classification of Histological Subtypes

The histological subtypes of lung cancer were defined according to the international classification system[30]. The lung cancers (ICD10 coded as C34.1 to C34.9) were sub-divided into SCC (M8070, M8083, M8072, M8074, or M8076), ADC (M8140, M8144, M8211, M8230, M8250, M8251, M8255, M8260, M8333, M8549, M8550, M8574, or M8576), SCLC (M8041, or M8045), LCC (M8012, M8013, M8246, or M8310), adeno-squamous carcinoma (ASC) (M8560), carcinoid tumor (M8240, M8249, or M8244), sarcomatoid tumor (M8033) or other tumor (M8010, M8020, M8022, M8032, M8050, M8430, or unspecified).

Statistical Analysis

The data was analyzed using the SAS 9.1 statistical software package (SAS Institute, Inc., Cary, NC). The relative frequency (RF) of each histological subtype and the demographic covariates (year of diagnosis, year of birth, and age) were calculated. The distribution of lung cancer subtypes was detected by chi-square test or *Z*-value. The RF of histological lung cancer subtypes was estimated. The RF of SCC and ADC in 2000-2012 was detected. $P<0.05$ was considered statistically significant.

RESULTS

Of the 15 526 male lung cancer patients identified from the health information system, 99 were excluded from this study due to duplicate records or missing information on histology, date of birth, date of diagnosis, or residence. Thus, 15 427 individual male lung cancer patients who were diagnosed between 2000 and 2012 were finally included in this study.

The major histological subtypes of lung cancer were squamous cell carcinoma (35%); adenocarcinoma (34%), small cell carcinoma (15%), large cell carcinoma (3%), and ASC (2%). The other tumors (10%) consisted of unspecified subtypes (9%) and categories (<1%).

Of the SCC patients, 52% were diagnosed with moderately-differentiated SCC, 43% with poorly-differentiated SCC, and 5% with well-differentiated SCC. Of the ADC patients, 54% were diagnosed as poorly-differentiated ADC, 38% with moderately-differentiated ADC and 8% with well-differentiated ADC. All lung lobes were included with the superior and inferior lobes accounting for 46% and 30%, respectively.

As shown in Table 1, the proportion of admitted male lung cancer patients was higher in 2012 than in 2002, and was higher after 2007 than before 2007

Table 1. General Parameters of Lung Cancer Patients Included in this Study (*n*=15 427)

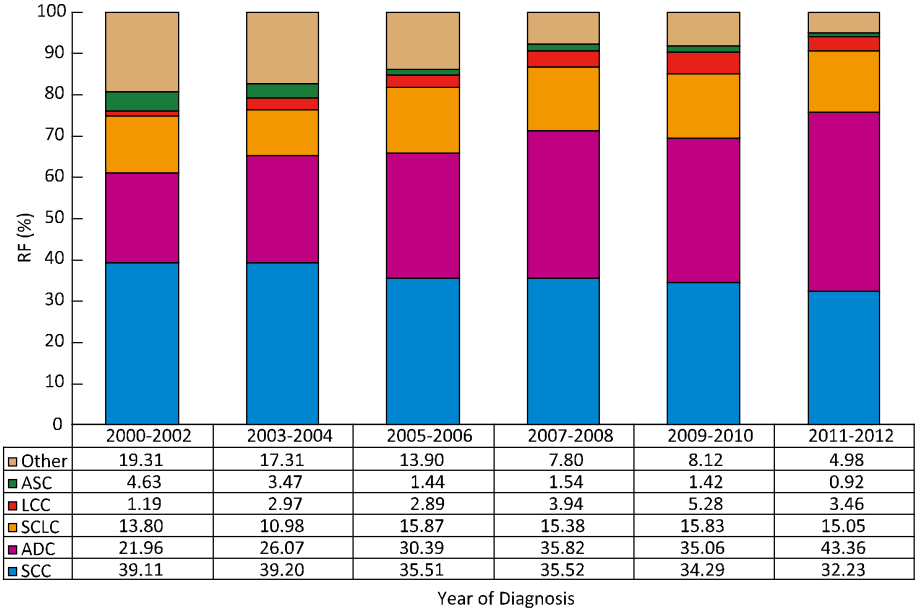
Class	*n*	(%)
All	15427	(100.0)
Year of diagnosis		
2000-2002	2 181	(14.14)
2003-2004	1 584	(10.27)
2005-2006	2 287	(14.82)
2007-2008	2 666	(17.28)
2009-2010	3 240	(21.00)
2011-2012	3 469	(22.49)
Age (year)		
<35	210	(1.36)
35-45	1 216	(7.88)
45-55	3 566	(23.12)
55-65	5 305	(34.39)
65-75	4 190	(27.16)
75+	940	(6.09)
Residential area		
Beijing	4 750	(30.79)
Hebei	2 492	(16.15)
Inner Mongolia	1 361	(8.82)
Shandong	1 033	(6.70)
Heilongjiang	952	(6.17)
Shanxi	929	(6.02)
Liaoning	923	(6.00)
Henan	663	(4.30)
Jilin	456	(2.96)
Other	1 868	(12.11)

(61% *vs* 39%). The majority of male lung cancer patients (85%) were diagnosed at the age of 45-74 years, especially at the age of 55-64 years (34%). Over 80% of the lung cancer patients were from Beijing (31%), Hebei Province (16%), Inner Mongolia Autonomous Region (9%), Shandong Province (7%), Heilongjiang Province (6%), Shanxi Province (6%), Liaoning Province (6%), Henan Province (4%), and Jilin Province (3%).

Figure 1 shows the RF of SCC, ASC, ADC, SCLC, and LCC. The RF of ADC was nearly 2-fold higher in 2011-2012 than in 2000-2002 (43% *vs* 22%), and was higher than that of SCC (43% *vs* 32%).

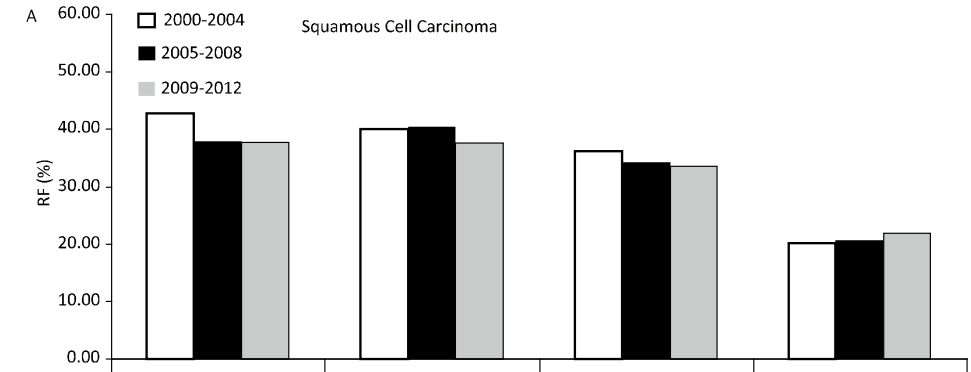
Figure 2 shows the RF of SCC and ADC in 2000-2012). The RF of SCC was significantly lower in male lung cancer patients born after 1961 than that of ADC in those born after 1960 (29% *vs* 49%).

Table 2 shows the RF of SCC, ADC, SCLC, LCC, and ASC in male lung cancer patients from the 9 geographic areas after adjusting for year of diagnosis and year of birth. The RF of SCC was 31% in Beijing and 41% in Jilin Province, the RF of ADC was 27% in Shanxi Province and 37% in Beijing, the RF of SCLC was 13% in Jilin Province and 17% in Shanxi Province, the RF of LCC was 2% in Liaoning Province and 5% in Beijing, the RF of ASC was 1% in Shanxi Province and 3% in Henan Province. The distribution of SCC was



	2000-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012
Other	19.31	17.31	13.90	7.80	8.12	4.98
ASC	4.63	3.47	1.44	1.54	1.42	0.92
LCC	1.19	2.97	2.89	3.94	5.28	3.46
SCLC	13.80	10.98	15.87	15.38	15.83	15.05
ADC	21.96	26.07	30.39	35.82	35.06	43.36
SCC	39.11	39.20	35.51	35.52	34.29	32.23

Figure 1. RF of different subtypes of lung cancer in 2000-2012. Trend tests were computed for SCC (*Z*=-6.117, *P*<0.0001), ADC (*Z*=17.909, *P*<0.0001), SCLC (*Z*=2.814, *P*=0.0049), LCC (*Z*=6.073, *P*<0.0001), and ASC (*Z*=-10.082, *P*<0.0001).



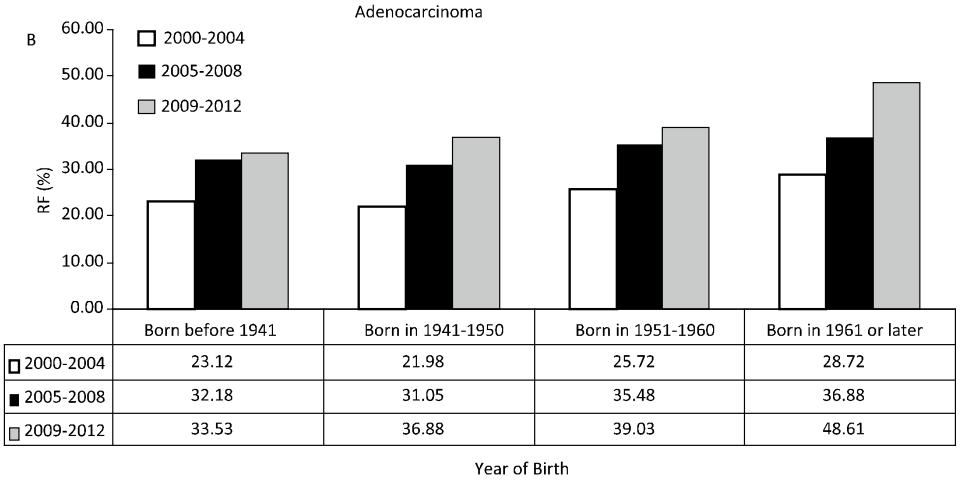


Figure 2. RF of lung cancer in 2000-2012.

Table 2. RF of Different Subtypes of Lung Cancer in Different Geographic Areas

Study Areas	SCC	ADC	SCLC	LCC	ASC	Other
All areas	35.41	33.59	14.80	3.47	2.00	10.73
Beijing	31.11	37.20	14.04	4.54	1.89	11.22
Hebei	38.00	31.01	16.46	2.90	1.96	9.67
Inner Mongolia	39.80	28.63	16.03	3.28	2.48	9.78
Shandong	36.35	33.86	14.28	3.29	2.15	10.07
Heilongjiang	39.80	32.50	13.83	2.49	1.33	10.05
Shanxi	39.86	26.80	16.68	2.96	1.31	12.39
Liaoning	34.69	34.88	14.85	2.36	2.13	11.09
Henan	31.69	37.17	13.62	4.30	2.74	10.48
Jilin	40.79	30.10	13.28	4.16	1.42	10.25

Note. Adjusted for year of diagnosis by 1-year intervals and year of birth by 5-year intervals. SCC: squamous cell carcinoma; ADC: adenocarcinoma; SCLC: small cell carcinoma; LCC: large cell carcinoma; ASC: adeno-squamous carcinoma. Distributions of the cases in the study areas were statistically significant for SCC (χ^2 =46.056, P<0.0001), ADC (χ^2 =51.634, P<0.0001), and SCLC (χ^2 =29.132, P<0.0001) and not significant for LCC (χ^2 =15.032, P=0.059) and ASC (χ^2 =10.347, P=0.242).

significantly different for the major histological subtypes in terms of geographic area of residence, areas (χ^2=46.056, P<0.0001), ADC (χ^2=51.634, P<0.0001) and SCLC (χ^2=29.132, P<0.0001).

Table 3 shows that the RF of SCC and ADC in different geographic areas. The proportion of ADC patients was higher than that of SCC patients from 2007-2012 in Beijing (42% *vs* 29%), Shandong Province (41% *vs* 34%), Heilongjiang Province (38% *vs* 36%), Liaoning Province (42% *vs* 33%), and Henan Province (44% *vs* 31%).

DISCUSSION

The incidence of adenocarcinoma was higher from 2000 to 2012 than that of squamous cell carcinoma from 2011 to 2012 in Chinese male, which is consistent with that in other developed and developing countries[13,15,19-27].

As early as the 1950s, the link between smoking and lung cancer had been established[13-14]. The tobacco industry produced 'light' and 'low-tar' cigarettes in the late 1960s to encourage health-concerned smokers to smoke these cigarettes rather than to quit smoking[31-34]. A number of studies showed that smoking 'low-tar' cigarettes increases the risk of adenocarcinoma[31-34] and ADC[27-29]. In fact, the shift from SCC to ADC has been observed in many countries[17-20,27-29,31-33]. The incidence of adenocarcinoma increased by over 50% from 1980 to 1997 among men, which is two-fold higher than that among women in a number of European countries[33].

Adenocarcinoma is the most common lung cancer in the USA and many Western European countries. It has been shown that smoking filtered cigarettes and modern cigarettes increases the risk of ADC[14,28,30-33].

In Japan, consumers of tobacco products have switched from smoking non-filtered to smoking filtered cigarettes since the 1960s[34]. The observed shift from SCC to ADC among Japanese men in the 1990s may be a result of this shift[16]. The factors contributing to this change are reported[33-39]. There is evidence that smoking low-tar cigarettes can cause adenocarcinoma[21].

In China, the average amount of tar per cigarette decreased from about 27.27 mg in 1983 to 16.10 mg in 2000[40]. In 2000, the National Tobacco Corporation of China banned the marketing of cigarettes containing over 17 mg of tar. The average tar per cigarettes further decreased from about 16.1 mg in 2000 to 11.9 mg in 2010. In 2010, sale of 'low-tar' cigarettes containing less than 10 mg of tar per cigarette was 3.7 million boxes, accounting for 8% of total cigarette sales in China[41-44]. Smoking cigarettes with filter tips since the early 1980s has played an important role in the absolute and relative increase of lung adenocarcinoma.

The limited epidemiologic data about lung cancer in Chinese mainland populations has shown the changes in histological subtypes of lung cancer[28-29]. The incidence of SCC decreased from 30% in 1998 to 24% in 2007 while that of ADC increased

Table 3. RF of SCC and ADC in Different Geographic Areas in 2000-2006 and 2007-2012

Study Areas	All cases		SCC				Changes of SCC	ADC				Changes of ADC
	2000-2006	2007-2012	2000-2006		2007-2012			2000-2006		2007-2012		
	(*N*)	(*N*)	(*N*)	RF_a	(*N*)	RF_b	(RF_b-RF_a)	(*N*)	RF_a	(*N*)	RF_b	(RF_b-RF_a)
All areas	(6 052)	-9375	(2 286)	38.04	(3 176)	33.71	-4.33	(1 587)	26.06	(3 595)	38.45	12.39
Beijing	(2 306)	(2 444)	(814)	34.51	(748)	29.21	-5.3	(646)	28.36	(1 006)	42.26	13.39
Hebei	(914)	(1 578)	(352)	39.4	(588)	37.17	-2.23	(222)	24.42	(559)	35.18	10.76
Inner Mongolia	(491)	(870)	(212)	43.8	(325)	37.69	-6.11	(107)	22.1	(278)	32.06	9.96
Shandong	(347)	(686)	(133)	39.49	(228)	33.65	-5.84	(89)	24.51	(282)	41.16	16.65
Heilongjiang	(341)	(611)	(151)	47.32	(214)	35.78	-11.54	(78)	21.86	(239)	38.31	16.45
Shanxi	(295)	(634)	(127)	44.45	(238)	37.19	-7.26	(69)	22.53	(206)	32.23	9.7
Liaoning	(320)	(603)	(118)	38.04	(195)	32.8	-5.24	(83)	25.97	(258)	42.45	16.48
Henan	(219)	(444)	(72)	34.26	(138)	31.42	-2.84	(65)	29.62	(196)	43.8	14.18
Jilin	(179)	(277)	(77)	47.58	(102)	37.41	-10.17	(44)	22.66	(94)	34.78	12.12

Note. RF was adjusted with age by 5-year intervals; *N*: The number of cases; SCC: squamous cell carcinoma; ADC: adenocarcinoma.

from 43% in 1998 to 47% in 2007 in Beijing[28]. Cancer registration data showed that the incidence of SCC decreased from 61% in 1991-1995 to 48% in 2001-2005 whereas that of ADC increased from 35% in 1991-1995 to 40% in 2001-2005 in Dalian, Liaoning Province, China[29]. The incidence of adenocarcinoma increased rapidly in 2011-2012, particularly in those born after 1960.

There are 3 limitations to this study. First, the study was carried out based on hospital in-patient records but not based on populations. Second, the study lacked detailed information on cigarette smoking history, type of smoked cigarettes, exposure to second hand smoke or other lung cancer risk factors. Third, the increase in RF of ADC was accompanied by decrease in the other category.

The histological epidemiologic features of lung cancer in China, particularly in the general population and in the population with a high exposure to smoking or environmental carcinogens, should be further investigated. The relationship between exposure to smoking and the development of specific histological lung cancers still needs to be further studied.

Lung cancer is the leading cause of death in urban and rural areas of China. The age-standardized death rate of lung cancer patients has increased in China. At present, smoking prevalence is 53% in Chinese men, highlighting that it is necessary to strengthen tobacco control policies and measures[7-8,45-46]. The findings in this study raise the close concern that 'light' and 'low-tar' cigarettes may increase the incidence of adenocarcinoma in the lung. The marketing and promotion of light and low-tar cigarettes hided the danger of these cigarettes both for Chinese public health professionals and for cigarette consumers. Those are more likely to mislead Chinese cigarette consumers to continue smoking rather than quit.

In conclusion, the incidence of adenocarcinoma is higher than that of squamous cell carcinoma of the lung in Chinese men, suggesting that the risk factors for lung cancer in Chinese men need to be further studied. Strategies to prevent smoking and encourage smoking cessation must be implemented urgently.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interests.

REFERENCES

1. WHO (2011). Global status report on noncommunicable diseases 2010. World Health Organization. http://www.who.int/nmh/publications/ncd_report2010/en/,2013/6/11
2. The Ministry of Health of the People's Republic of China. Report on Third national retrospective sampling death survey. Beijing: Peking Union Medical College Press, 2008; 10-22.
3. National Office for Cancer Prevention and Control, National Center for Cancer Registry, Disease Prevention and Control Bureau, MOH. Chinese Cancer Mortality Report-Third national retrospective sampling death survey. Beijing, People's Health Press, 2010; 35.
4. National Cancer Center, Disease Prevention and Control Bureau of Ministry of Health (2012). 2012 Chinese Cancer Registry Annual Report. Military Medical Science Press, Beijing, p28-39, p72-5
5. Zou XN, Wan X, Dai Z, et al. Epidemiological Characteristics of Cancer in Elderly Chinese. ISRN Oncology, 2012; Volume 2012, Article ID 381849. doi:10.5402/2012/381849
6. IARC. IARC Fact Sheet, Lung cancer incidence, mortality and prevalence worldwide in 2008. http://globocan.iarc.fr/factsheet.asp, 2013/5/12.
7. Yang GH, Li Q, Wang CX, et al. Findings from 2010 Global Adult Tobacco Survey: implementation of MPORWER policy in China. Biomed Environ Sci, 2010; 23, 422-9.
8. China Centers for Disease Control and Prevention (2010). Global Adult Tobacco Survey (GATS) China 2010 country report.http://nccd.cdc.gov/GTSSData/Ancillary/DownloadAttachment.aspx?ID=862, 2013/6/20.
9. Sansone G, Fong GT, Hall PA, et al. Time perspective as a predictor of smoking status: findings from the International Tobacco Control (ITC) Surveys in Scotland, France, Germany, China, and Malaysia. BMC Public Health, 2013; 13, 346
10. Thun MJ, Day-Layy CA, Calle EE, et al. Excess Mortality among Cigarette Smokers: Changes in a 20-Year Interval. Am J Public Health, 1995; 85, 1223-30.
11. Liu BQ, Peto R, Chen ZM, et al. Emerging tobacco hazards in China: 1. retrospective proportional mortality study of one million deaths. BMJ, 1998; 317, 1411-22.
12. Khuder SA, Dayal HH, Mutgi AB, et al. Effect of cigarette smoking on major histological types of lung cancer in men. Lung Cancer, 1998; 22, 15-21.
13. International Agency for Research on Cancer. Tobacco smoke and involuntary smoking. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, IARC Scientific Publications, 2004; 83, 171-2.
14. Thun MJ, Lally CA, Flannery JT, et al. Cigarette smoking and changes in the histopathology of lung cancer. J Natl Cancer Inst, 1997; 89, 1580-6.
15. Knoke JD, Burns DM, and Thun MJ. The change in excess risk of lung cancer attributable to smoking following smoking cessation: an examination of different analytic approaches using CPS-I data. Cancer Causes Control, 2008; 19, 207-19.
16. Devesa SS, Bray F, Vizcaino A, et al. International lung cancer trends by histologic type: male, female differences diminishing and adenocarcinoma rates rising. Int J Cancer, 2005; 117, 294-9.
17. Kenfield SA, Wei EK, Stampfer MJ, et al. Comparison of aspects of smoking among four Histologic types of lung cancer. Tob

Control, 2008; 17, 198-204.
18. Pesch B, Kendzia B, Gustavsson P, et al. Cigarette smoking and lung cancer-relative risk estimates for the major histological types from a pooled analysis of case-control studies. Int J Cancer, 2011; 131, 1210-9.
19. Jemal A, Center MM, DeSantis C, et al. Global Patterns of Cancer Incidence and Mortality Rates and Trends. Cancer Epidemiol Biomarkers Prev, 2010; 19, 1893-907.
20. Missaoui N, Hmissa S, Landolsi H, et al. Lung Cancer in Central Tunisia: Epidemiology and Clinic pathological Features. Asian Pac J Cancer Prev, 2011; 12, 2305-9.
21. Wynder EL, Muscat JE. The changing epidemiology of smoking and lung cancer histology. Environ Health Perspect, 1995; 103 Supplement 8, 143-8.
22. Russo A, Crosignani P, Franceschi S, et al. Changes in lung cancer histological types in Varese cancer registry. Eur J Cancer, 1997; 33, 1643-7.
23. Wahhah M, Boroumand N, Castro C, et al. Changing trends in the distribution of the histologic types of lung cancer: a review of 4,439 cases. Ann Diagn Pathol, 2007; 11, 89-96.
24. Bhurgri Y, Bhurgri A, Usman A. et al. Patho-epidemiology of lung cancer in Karachi (1995-2002). Asian Pacc J Cancer Prev, 2006; 7, 60-4.
25. Toyoda Y, Nakayama T, Ioka A, et al. Trends in lung cancer incidence by histological type in Osaka, Japan. Jpn J Clin Oncol, 2008; 38, 534-9.
26. Everatt R, Kuzmickien I, and Senuli A. Cigarette smoking and trends in lung cancer incidence in Lithuania: An analysis by histological type. Medicina (Kaunas), 2011; 47, 222-9.
27. Katanoda K and Yako-Suketomo H. Time trends in lung cancer mortality between 1950 and 2008 in Japan, USA and Europe based on the WHO mortality database. Jpn J Clin Oncol, 2011; 41, 1046-7.
28. Wang N, Chen WQ, Zhu WX, et al. Incidence trends and pathological characteristics of lung cancer in urban Beijing during period of 1998-2007. Chin J Prev Med, 2011; 45, 249-54.
29. Zhang LM, Lin H, Mei H, et al. An analysis of epidemic trends of lung cancer from 1991 to 2005 in Dalian city, Liaoning province. China Cancer, 2008; 17, 84-7. (In Chinese)
30. Travis WD, Brambilla E, Müller-Hermelink HK, et al. WHO Classification of Tumours: Pathology and Genetics of Tumours of the Lung, Pleura, Thymus and Heart. Lyon, France: IARC Press; 2004.10.
31. Tindle HA, Rigotti NA, Davis RB, et al. Cessation among smokers who used "light" cigarettes: results from the 2000 National Health Interview Survey. Am J Public Health, 2006; 96, 1498-504.
32. Stellman SD, Muscat JE, Thompson S, et al. Risk of squamous' cell carcinoma and adenocarcinoma of the lung in relation to lifetime filter cigarette smoking. Cancer, 1997; 80, 382-8.
33. Stellman SD, Muscat JE, Thompson S, et al. Risk of squamous cell carcinoma and adenocarcinoma of the lung in relation to lifetime filter cigarette smoking. Cancer, 1997; 80, 382-8.
34. Marugame T, Sobue T, Nakayama T, et al. Filter cigarette smoking and lung cancer risk; a hospital-based case-control study in Japan. Br J Cancer, 2004; 90, 646-51.
35. Travis WD, Travis LB, and Devesa SS. Lung cancer. Cancer, 1995; 75(1 Suppl), 191-202.
36. Youlden DR, Cramb SM, and Baade PD. The international epidemiology of lung cancer: geographical distribution and secular trends. J Thoracic Oncology, 2008; 3, 819-31.
37. Hanai A, Benn T, Fujimoto I, et al. Comparison of lung cancer incidence rates by histological type in high and low incidence countries, with reference to the limited role of smoking. Jpn J Cancer Res, 1988; 79, 445-52.
38. Shibuya K, Inoue M, and Lopez AD. Statistical modeling and projections of lung cancer mortality in 4 industrialized countries. Int J Cancer, 2005; 117, 476-85.
39. Thun M, Peto R, Boreham J, et al. Stages of the cigarette epidemic on entering its second century. Tob Control, 2012; 21, 96-101.
40. China National Tobacco Corporation (2004). China national tobacco corporation: the new upper limit of cigarette tar level. http://www.tobaccochina.com/news/data/20041/z114085554.htm.2004/1/14
41. Horizon-China. An analysis of the market of light cigarettes in China, 2007. http://www.tobaccochina.com/news/analysis/wu/20086/20086118171_307124.shtml.2008/6/11
42. Bialous SA and Peeters S. A brief overview of the tobacco industry in the last 20 years. Tob Control, 2012; 21, 92-4.
43. Lei ZQ, Yang J, Chu GH, et al. Review, current situation and prospect of the course of reducing tar in domestic cigarettes. Tobacco Science & Technology / Inspection & Standard, 2003; 5, 29-31.
44. Zi Y. Trend of low-tar cigarette development in market. http://www.tobaccochina.com/management/market/stratagem/20113/20113158398_453357.shtml.2011/3/16
45. Niu SR, Yang GH, Chen ZM. et al. Emerging tobacco hazards in China: 2. Early mortality results from a prospective study. BMJ, 1998; 317,1422-3.
46. Yang GH and Zhong NS. Effect on health from smoking and use of solid fuel in China. Lancet, 2008; 372, 1445-6.